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PATENT SPECIFICATION

DRAWINGS ATTACHED

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COMPLETE SPECIFICATION

Method and Apparatus for the Continuous Production of Wort as Hopped Wort

We, WEIGELWERK AKTIENGESELLSCHAFT, of 110, Altendorfer-strasse, Essen, Federal German Republic, a joint-stock company organised under the laws of the Federal German Republic, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to a method and apparatus for the continuous production of wort, as hopped wort.

For the separation and filtration of worts clearing vats or mash filters having a fixed filter bottom have been used in such a manner that the spent grains depositing on the filter bottom serve as a filtering layer of a predetermined thickness. From the layer of spent grains and from the filter bottom there may be struck out the first wort, more or less concentrated sparging water, or the last runnings. The known methods using ordinary clearing vats and mash filters require not only long separation and filtration periods, but also require large spaces in the breweries, and it is possible only to a very limited extent to speed up or to control the process.

Moreover the separation and filtration takes place discontinuously. For the continuous production of wort as hopped wort and for the separation and filtration of larger or smaller quantities according to requirements, it has been proposed to subdivide a clearing vat into cells which are operated in succession, or to use filter belts. In the first case there are limits in the size of the vats, while with filter belts a through treatment and filtering of any desired quantity of the mash is difficult to attain.

The invention relates to a continuous production of wort as hopped wort, and consists in that the continuously prepared mash is

filled uninterruptedly between filter walls of a tower and moves downwards along these filter walls, while the first wort is drawn off through these filter walls, that the spent grains are sparged and at the lower end of the tower are introduced into a conveyor and discharged by the latter out of the tower.

The advantages attained by the invention consist in that the entire process is under control during all its steps, so that the operation is continuous and adjustable according to requirements, the control of each step being adjustable according to requirements without disturbing the other steps or the process as a whole.

Hereinafter the invention will be explained with reference to the accompanying drawing which diagrammatically illustrates by way of example an embodiment of an apparatus for carrying out the method.

In the drawing, Fig. 1 is a longitudinal section on the line A—A of Fig. 2, and Fig. 2 is a side elevation of a vertical or inclined tower 1 which in part is constructed with double walls having inner filter walls 2 and 3 and outer walls 4 and 5, the latter carrying transverse walls 6 at intervals, which subdivide the space between the inner filter walls 2 and 3 and their outer walls 4 and 5 into compartments or chambers 11, 12, 13. In the region of the transverse walls 6, inlets and outlets 7 are provided. The length of the walls 2 to 5 of the tower depends on the volumes to be treated, and may be extended in a simple way, if desired. The thickness of the cake 8 of spent grains between the filter walls 2 and 3 may for example amount to 15—40 centimetres. At the bottom of the tower a conveyor screw 9 may be arranged in a well 10. The walls 2 to 5 may be hinged and adjustable individually or in unison both angularly and as regards their distance from one another, particularly in the

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lower part of the tower, so that also a squeezing pressure may be applied by them to the layer 8 of spent grains. The passage into the well of the screw may be convergent or divergent and may be covered by a perforated screen.

In the continuous production of wort as hopped wort according to the invention, the mash consisting of grist and liquor is introduced into the tower over a weir 16 or a closed pipe system by any other supply device from above, and distributed uniformly over the whole length of the tower. All the inner walls of the tower between which the mash is stored may be formed by sieves. From the chambers 11, 12, 13 the first-wort or the sparging wort may freely flow off at both or all sides. Alternatively sparging water may be pumped in the direction of the arrows 14 or 15 into the chambers 11—13 and through the cake 8 of spent grains, and force the first wort together with the sparging water out of the spent grains. The direction of flow in adjacent chambers may be reversed or the liquor may be passed from one chamber to another chamber situated at a higher or lower level.

From each chamber the wort may be drawn off through outlets 7 and may be conducted according to requirements either to another chamber or to the brewing coppers. It is of advantage to provide above the uppermost chamber of the tower a head zone with impermeable walls whereby the water pressure required for sparging the upper layer of spent grains may be reduced to e.g. one tenth of the total sparging. The sparging of several filter layers may be started under a high pressure in the lowest layer and successively proceed to higher layers so that the whole cake of spent grains in the tower is sparged from the bottom to the top in sections, until the wort has the concentration desired. One may accordingly proceed in either direction of Fig. 1 and may begin at any point of the tower, i.e. from top to bottom or in the reverse as well as in part-sections, and admix the sparging liquor with the wort; some sections may even be by-passed by the sparging liquor when the spent grains in a particular manner of production require a period free from wort or sparging water.

In order to facilitate the cleaning of the tower or to vary the height of the chambers, at least part of the inner wall of the tower may be hinged, the movable wall portions being sealed by conventional inflatable seals against the stationary walls.

The side walls of the tower may be hinged and thus be angularly adjustable relative to one another. They may then be adjusted convergent downwardly for the purpose of squeezing the cake of spent grains, or divergent for facilitating the discharge of the spent grains, a conveyer screw then effecting the

squeezing of the cake. At the beginning of the operation the screw has to be at a standstill.

The screw may moreover be covered by a perforated wall or screen.

By increasing the pressure of the sparging liquor, the rate of striking out the wort may be increased, or conversely slowed down by pressure reduction. The tower may be inclined as a whole from the vertical, in order to control the speed of descent of the mash through it.

The first wort struck out as well as the sparging wort may be recycled through the filter layer of spent grains in order to eliminate any turgid proteins or the worts may be clarified by centrifuging in a centrifuge arranged at the outlet of the tower. It may then be advantageous to recycle some constituents separated out by centrifuging with the sparging liquor or with the mash, so that the last turgid substances are eventually retained in the spent grains and are thereby filtered out.

If it is necessary to heat certain parts of the tower, heating elements may be built in. The spent grains squeezed out and emerging from the screw conveyer may be conveyed in the usual manner to a drying stage, where their drying requires only a reduced amount of energy since liquor has already been squeezed out of them. In order to sense the temperature, temperature feelers are distributed over the cross sectional area of the tower. Moreover in order to get the process according to the invention going, firstly dry spent grains may be charged in conjunction with wet spent grain, and spent grains which had already been sparged may be returned into the chambers, in order to extract even the last remnants of wort from them.

Restricted orifices may be provided in the ducts connecting the chambers with one another in order to provide a pressure drop between them. Conversely pressure booster pumps may be interposed between one chamber and the others, if desired. Obviously several towers constructed according to the invention may be arranged side by side in a brewing house.

WHAT WE CLAIM IS:—

1. A method for the continuous production of wort as hopped wort, wherein a continuously prepared mash is filled uninterruptedly between filter walls of a tower, and while moving in the said tower downwards along the said filter walls, the first wort is drawn-off through the said filter walls, and the spent grains are sparged with water through said filter walls, and at the lower end of the said tower are passed into a conveyer and discharged by the latter from the said tower.

2. A method according to claim 1, wherein the first wort is driven out of the spent grains

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by water, and the spent grains are subsequently sparged by water forced into them in separate chambers of the said tower.

5 3. A method according to claim 2, wherein the direction and succession of the flow of the sparging liquor through the said mash and spent grains chambers is varied.

10 4. A method according to any one of the claims 1 to 3, wherein the sparging pressure of the sparging liquor is varied at different levels of the said tower.

15 5. A method according to any one of the claims 1 to 4, wherein the spent grains are discharged from the said tower through a converging or diverging passage, and, if desired, are squeezed out while being discharged.

20 6. A method according to any one of the claims 1 to 5, wherein the spent grains are compacted or loosened by moving walls of said tower towards or apart from one another.

25 7. A method according to any one of the claims 1 to 6, wherein the rate of movement of the mash and of the spent grains in the said tower is varied by varying the inclination of the walls of said tower or of the tower as a whole.

30 8. A method according to any one of the claims 1 to 7, wherein the wort and the sparging liquor are repeatedly passed through the cake of spent grains at various levels of the said tower until the concentration desired is reached.

35 9. A method according to any one of the claims 1 to 8, wherein the worts are clarified by centrifuging in a centrifuge arranged at the outlet of the tower.

40 10. A method according to any one of the claims 1 to 9, wherein the mash and the spent grains are subjected to a heat treatment in the said tower.

11. A method according to any one of the

claims 1 to 10, wherein the spent grains after having been sparged are passed together with the mash between the filter walls of said tower. 45

12. A method according to any one of the claims 1 to 11, wherein the cake of spent grains is sparged by a reversible flow of liquor at different variable pressures. 50

13. A method according to any one of the claims 1 to 12, wherein the liquor leaving the said tower is re-introduced into the mash or into the sparging water, or is subsequently subjected to centrifuging, the constituents separated out by centrifuging being admixed to the sparging water, the mash or the wort if desired. 55

14. An apparatus according to claim 1, wherein the said tower has impermeable outer walls forming with the said filter walls a double-wall construction, the space between said outer and inner walls being subdivided into chambers or compartments by transverse walls. 60

15. An apparatus according to claim 14, wherein temperature feelers are distributed across the cross section of the said towers.

16. An apparatus according to claim 14 or 15, wherein restricted orifices and/or pressure booster pumps are interposed between the said chambers of the tower for the control of the pressure of the liquor between them. 70

17. An apparatus according to claim 1, wherein the said filter walls are adjustable angularly and/or in their spacing relative to one another. 75

18. The method according to claim 1, substantially as herein described. 80

19. An apparatus according to claim 14, substantially as herein described with reference to the accompanying drawing.

S. MITTLER,
Chartered Patent Agent.

Fig. 1

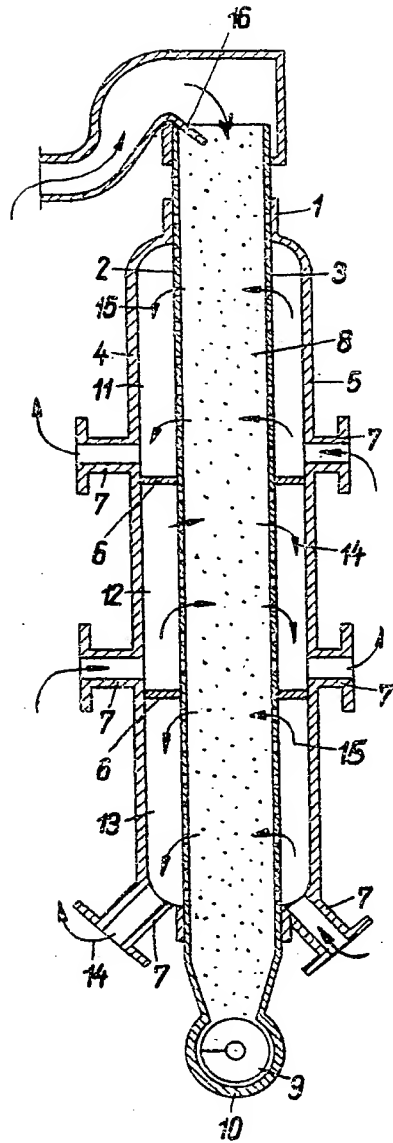


Fig. 2

